# Baileya

*A Quarterly Journal of Horticultural Taxonomy*

Vol. 6 SEPTEMBER 1958 No. 3

Notes on Cultivated Species of Ficus in the Philippines 129

Callisia elegans, a New Species, with Notes on the Genus 135

Horticultural Progress during Liberty Hyde Bailey's Lifetime 148

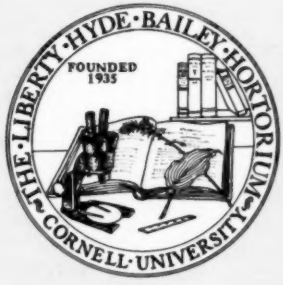
Notes on the Cultivated Compositae 1. Townsendia 158

Studies in the Cultivated Boraginaceae 2. Echioides and Arnebia 164

Plantsmen in Profile, VII George W. Park and Sons 169

Book Reviews 172

*Observing the One Hundredth Birthday Anniversary of Liberty Hyde Bailey*



BAILEYA. - A quarterly journal devoted to the botany of cultivated plants and especially to their identification, nomenclature, classification, and history in cultivation. Editor: William J. Dress.

Price: $2.00 per year, net, postpaid, in funds payable at par in United States currency in New York. Single copies (current or back numbers): 50 cents each. Address subscriptions and requests for back numbers to The Bailey Hortorium, Cornell University, Ithaca, New York. Make all remittances payable to BAILEYA.

Notes and short scientific papers relating to the systematics of cultivated plants, and to their history in cultivation or to the literature pertaining to such topics, will be considered for publication to the extent that the limited space of the publication permits. Line illustrations to accompany such papers are invited. Authors of more than two pages of print will receive in recompense 15 copies of the issue in which their contribution appears. No proof will be submitted to the author and copy is considered in final form as received. Extracted reprints without change in pagination will be provided at cost [$2.00 per page per 100 copies, which is the minimum number which should be ordered].

BAILEYA
Vol. 6 September 1958 No. 3

Mailed at Ithaca, N. Y., September 30, 1958

# Notes on Cultivated Species of Ficus in the Philippines

Juan V. Pancho
College of Agriculture
University of the Philippines
Laguna, Philippines

The genus Ficus belongs to the Moraceae (the mulberry family) and contains shrubs, trees, or lianas which are indigenous to the tropics or subtropics of both the Old and New World. The number of binomials actually published under this generic name approximates 3,000 or more, but about one-third of them are said to be merely synonyms.

The genus is easily recognized by its inflorescence - a receptacle which bears on its inner surface numerous small flowers and which is provided with an apical opening closely guarded by umbilical scales. The individual flowers are male, female, gall, neuter, and pseudo-hermaphrodite, in the same or different receptacles of the same or different plants. They vary in size and color, ranging from the size of a pea to that of an ordinary orange, and in color are green, whitish, yellow-red, or dark purple.

In the Philippines about 250 species have been reported. Most of the Philippine figs are found in the woods of the foothills and in shrubberies of the subalpine regions.

Among the vast number of species there exist many kinds useful as fruit trees, shade or road-side trees, ornamentals, medicinal or fiber-yielding or caoutchouc-producing plants, etc. Quisumbing[1] lists the following species as having medicinal value: Ficus benjamina Linnaeus, F. Minahassee Miquel, F. Payapa Blanco, F. pumila Linnaeus, F. retusa Linnaeus, F. stipulosa Miquel, F. variegata Blume, and F. ulmifolia Lamarck. The latex of these is official in the French pharmacopoeia. It possesses anthelmintic properties against ascaris, trichurids, and pinworms, and is also used in the treatment of skin diseases. Juices from barks are reputed to be curative of liver diseases like diabetes, and to be aphrodisiac; they are also believed to be of much value in spermatorrhea and gonorrhea. The leaves are applied topically for boils, as a poultice in rheumatism, and as an astringent. The juice is used as a flatulent for colic and when heated is applied as a poultice to abscesses, to promote suppuration.

Brown[2] reports the industrial value of several species of Ficus. Ficus indica Linnaeus is promising as a source of tannin, oil, and

[1] Quisumbing, E. Medicinal Plants of the Philippines, 231-238. Manila, Bureau of Printing, 1951.

[2] Brown, W. H. Useful Plants of the Philippines 1: 472-477. Manila, Bureau of Printing, 1943.

wax; F. calophylloides Elmer, F. elastica Roxburgh (Indian rubber tree), F. Minahassee Miquel, F. Payapa Blanco, F. benjamina Linnaeus, F. obscura Blume, and F. celebica Blume as very good sources of fiber. On account of its great strength, toughness, and durability, such fiber is used for making wild-hog traps, among other things.

The young shoots of F. pseudopalma Blanco and F. variegata Blume are prepared as salad. The bark of F. conora King exudes abundant water when cut, and this may be collected for drinking purposes. Leaves of Ficus odorata Merrill are used for polishing and scouring purposes because of their harsh and scabrous character.

Because of the shade which some species provide and their resistance to strong winds and their ability to thrive even in stony, dry places, they are often planted as ornamentals along avenues, in parks, and on campuses. About 18 species are cultivated in the islands. Except for F. palawanensis, F. concinna, F. conora, and F. stipulosa, all these species are grown also in the United States, chiefly in southern Florida and California.

## Key to the Species of Ficus Cultivated in the Philippines

1. Plant a vine, becoming shrubby; receptacle 4-5 cm. long. . . . . .F. pumila
1. Plants trees or shrubs; receptacle 2.5 cm. or less long (sometimes larger in F. carica).
   2. Fr. edible; lvs. commonly 3- to 5-lobed. . . . . F. carica
   2. Fr. not edible; lvs. otherwise.
      3. Shrub, erect and unbranched; lvs. to 7 dm. long or even longer, crowded at the top of the trunk. . . . . .F. pseudopalma
      3. Shrubs or trees, branched; lvs. less than 3 dm. long.
         4. Lvs. broadly ovate, the tip caudate and half as long as the blade. . . . . .F. religiosa
         4. Lvs. various, but not as above.
            5. Receptacles borne on the trunk and on larger branches on tubercles.
               6. Tubercles flexible, to 1 m. or even longer. . . . . .F. conora
               6. Tubercles rigid, not exceeding 2 dm. long.
                  7. Lvs. pubescent, the base subauriculate or slightly inequilateral. . . . . .F. nota
                  7. Lvs. glabrous, the base rounded, commonly cordate. . . . . .F. variegata
            5. Receptacles solitary to numerous in the leaf-axils or below the foliage.
               8. Mature receptacle 13 mm. or less across, pink or purple or yellowish-red.

9. Receptacle sessile, without spots at maturity.
   10. Lowermost pair of primary lateral nerves stronger and more conspicuous than the others, causing the blade to appear 3-nerved at base.
      11. Blades of lvs. mostly 5 cm. or more wide, acute to obtuse basally, the primary lateral nerves distinct, much more prominent than the secondary ones. . . . . F. indica
      11. Blades of lvs. mostly 3.5 cm. wide or less, cuneate basally, the primary lateral nerves not much more distinct than the secondary.
         12. Tip of lf.-blade blunt or scarcely pointed. . . . . F. retusa
         12. Tip of lf.-blade apiculate. . . . . F. retusa var. nitida
   10. Lowermost pair of primary lateral nerves not stronger or more conspicuous than the other primary nerves, the blade obviously 1-nerved. . . . . F. benjamina
9. Receptacle shortly pedunculate, spotted at maturity.
   13. Receptacles numerous below the foliage, fascicled. . . . . F. stipulosa
   13. Receptacles few, solitary or in pairs in the leaf-axils. . . . F. concinna
8. Mature receptacle 18 to 25 mm. across, yellow, yellowish-green, or orange.
   14. Surface of lvs. scabrous, the base strongly inequilateral; receptacle densely tomentose. . . . . F. odorata
   14. Surface of lvs. smooth and glabrous or pubescent, but not scabrous; receptacle glabrous or sparsely hairy.
      15. Lvs. fiddle-shaped, the base cordate. . . . . F. lyrata
      15. Lvs. not fiddle-shaped, the base acute or obtuse.
         16. Subtending bracts 1/4 as long as the receptacle.
            17. Lvs. 15-25 cm. long; stipules large, red, thin; bracts united into a disk. . . . . F. elastica
            17. Lvs. less than 15 cm. long; stipules small, inconspicuous; bracts not united into a disk, valvate. . . F. palawanensis
         16. Subtending bracts much smaller or partly obsolete.
            18. Lvs. 15-20 cm. long, densely pubescent when young; receptacle 2.5 cm. across. . . . . F. Payapa
            18. Lvs. less than 13 cm. long, glabrous; receptacle about 20 mm. across. . . . . F. benjamina var. comosa

Ficus pumila Linnaeus. Creeping fig. A splendid small-leaved climber, native to southern China and Japan. The leaves on creeping stems are 2.5 cm. or less long, cordate-ovate, sessile or shortly pedicellate, the base oblique; those on the fruiting stems 5-10 cm. long and elliptic or oblong. This vigorous vine has taken the place of ivy in the tropics. It is easily propagated by cuttings.

Ficus carica Linnaeus. Common fig. Although a native of the Mediterranean regions, it is cultivated in the Philippines for its edible fruits.

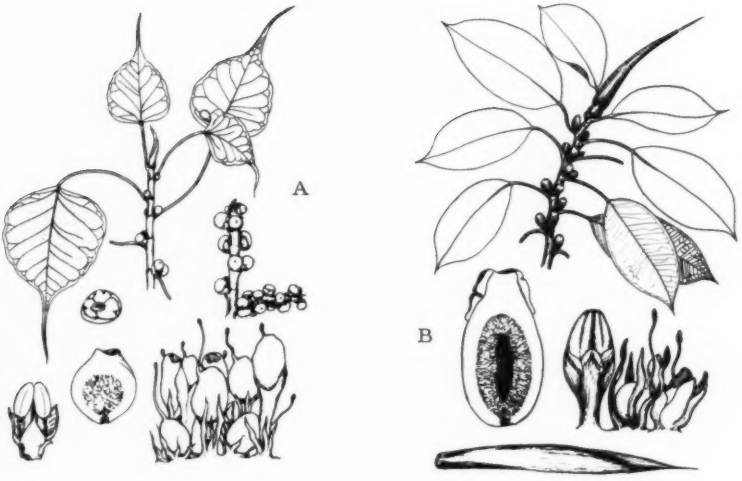



Fig. 24. A, Ficus religiosa. B, Ficus elastica. Original illustration by Arnulfo C. del Rosario.

Ficus pseudopalma Blanco. Palm-like shrub, indigenous to the islands. Leaves to 7.5 dm. long, oblanceolate, narrowed to the slightly cordate base, subsessile or shortly petioled. Receptacles dark green, ovoid, obscurely angular, to 4 cm. across, usually in pairs on short peduncles in the axils of the leaves. Cultivated for its culinary and ornamental value.

Ficus religiosa Linnaeus. Bo tree. A recent introduction from India. Cultivated in Manila, Cebu, and perhaps other large towns. The species is well characterized by the long-stalked, heart-shaped, slenderly caudate leaves. At a distance it can be recognized from the untidy and yellowish appearance of the crown as the leaves age and by the clatter produced by the leaves when stirred by wind.

Ficus conora King. This species is easily recognized by its long tubercles drooping from the larger branches. The receptacles are obovoidly globose, to 20 mm. across, solitary or in few-fascicled clusters. Leaves and twigs are rusty-pubescent to glabrous with age. Occasionally cultivated. Although a native of Malaya, it is now widely distributed in the islands in forests at low altitudes.

Ficus nota Merrill. Similar to F. conora in habit, but the figs are densely clustered on short tubercles on the trunk and larger branches. An indigenous species, it is successfully grown in some of the Manila gardens.

Ficus variegata Blume. A tree with prominent slender buttresses and smooth pinkish-brown bark. The wide-spreading branches with broad leaves afford an excellent shade. Native of Malaya.

Ficus indica Linnaeus. Similar in habit to F. benjamina. Planted along avenues, in parks and campuses. Very resistant to strong winds. A native of tropical Asia.

Ficus retusa Linnaeus. Along with its var. nitida, commonly cultivated in parks and along avenues because of its resistance to strong wind and its ability to thrive even in stony dry places. Native of Java.

Ficus benjamina Linnaeus. Tree with drooping branches, poplar-like. Leaves thin, coriaceous, ovate-elliptic. Figs globose, to 13 mm. across, red. Variety comosa King has larger leaves and larger, yellow figs to 20 mm. across. Planted along avenues and parks. A native of tropical Asia, now widely distributed in the islands. It is usually confused with F. retusa, from which it differs in having scanty aerial roots, drooping branches, leaves with triangular and sometimes twisted acumen, and inconspicuous basal veins.

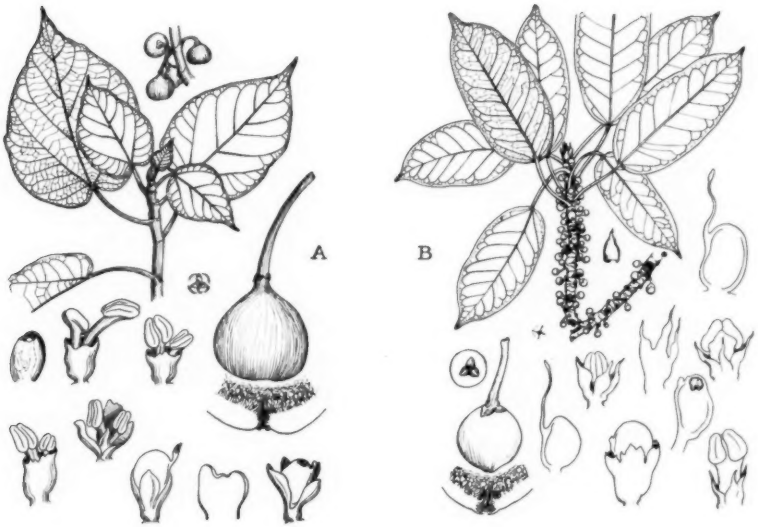



Fig. 25. A, Ficus variegata. B, Ficus stipulosa. Original illustration by Arnulfo C. del Rosario.

Ficus stipulosa Miquel. The presence of numerous crowded receptacles on the branchlets and the white sticky sap exuded when the bark is cut easily distinguish this from other species. It grows to about 20 m. and is cultivated mainly for shade. A deciduous species, it sheds its leaves and remains bare for a few days and then develops the new leaves over most of the crown simultaneously. The buds are colorful because of their pink coloration. Native of tropical Asia.

Ficus concinna Miquel. Planted in parks and gardens in Manila and other large towns. The whitish midvein of the leaves and its divergently spreading branches distinguish it from other species. Native of tropical Asia.

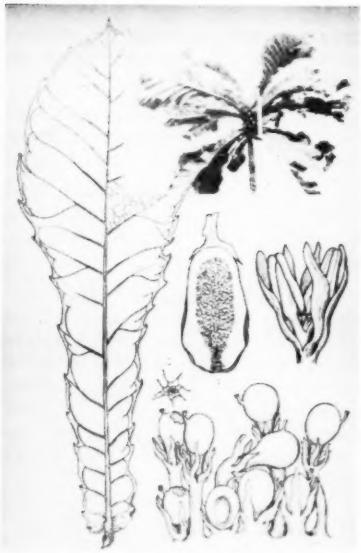


Fig. 26. Ficus pseudopalma.

Ficus odorata Merrill. One of the most commonly cultivated figs in the islands. It is easily recognized by the leaf's obliquely cordate base and its harsh upper surface, which is used for polishing and scouring. The branches are hispid and descending. Dried specimens are fragrant. An indigenous species, it is distributed throughout the archipelago.

Ficus lyrata Warburg. A recently introduced species commonly grown as an indoor plant. A native of tropical Africa, now pantropic in distribution.

Ficus elastica Roxburgh. India rubber tree. Large glabrous tree, with leaves thick and glossy, oblong or elliptic, to 3 dm. long. A favorite indoor plant in its juvenile state. Native of India.

Ficus palawanensis Merrill. An indigenous species, usually cultivated in parks and campuses. The wide-spreading branches provide an excellent shade.

Ficus Payapa Blanco. Occasionally cultivated in parks and campuses for shade. Deciduous. Endemic.

# Callisia elegans, a New Species, with Notes on the Genus

Harold E. Moore, Jr.

For some four years, an unidentified species of the family Commelinaceae has flowered in the conservatory of the Department of Ornamental Horticulture at Cornell University. Plants from two sources - Julius Roehrs Company of Rutherford, New Jersey, and Mr. T. J. Newbill, of Fort Lauderdale, Florida - have proved identical. The plant from Roehrs has been listed as a Mexican species of Setcreasea (using the epithet striata) by A. B. Graf in Exotics ed. 2: 66, 1954, and in later editions including the expanded Exotica 239, 1957, where it is well illustrated. The proper genus for it is clearly Callisia, but the species does not correspond to any accounted for by Matuda in Anales del Instituto de Biología 26: 379-388, 1955 and 27: 356, 1957.

A description of the undescribed Callisia, and most of the accompanying material presented here, had been prepared for publication when, through the kindness of Mr. Graf, I learned that Mr. Edward J. Alexander of the New York Botanical Garden had independently determined it as a new species. Mr. Alexander has kindly permitted the use of his proposed name, Callisia elegans, and has provided additional notes for the description and the text. According to him, cuttings from a plant of C. elegans were originally brought by Thomas MacDougall from Tehuantepec, Oaxaca, Mexico, in 1943. These cuttings flowered in the conservatories of the New York Botanical Garden in December 1943. The plant proved such a rapid grower, of such easy propagation, and so attractive that small pots of it were included in shipments to the Woolworth stores by the Ivy Floral and Landscape Company. This must have been the original source of its spread through the nursery trade as the plant was unknown before that time, and no further introduction of it has been recorded. Thus far, attempts to induce production of seeds have failed.

Another species of Callisia is cultivated rather widely, most frequently under the name Spironema fragrans. An additional species is cultivated in collections but several others deserve horticultural and botanical attention. The following notes and summary of the genus do not pretend to be the detailed study that Callisia deserves (three species are known to me only from descriptions). They are presented, rather, in the hope that they will stimulate further introduction and study.

Callisia was described by Linnaeus without mention of the type species, Callisia repens. The latter was first assigned to the genus in the second edition of Species Plantarum, 1762. For many years it was the only species, but gradually others were associated with it, often erroneously. Such erroneous associations have been frequent in the family because the deliquescent nature of the short-lived flowers, which have generally been relied on for differentiating characters, makes delimitation of genera from floral morphology difficult. Dr. R. E. Woodson, Jr., in a most useful commentary on the genera of Commelinaceae in North America (Annals of the Missouri Botanical Garden 29: 141-154, 1942) drew attention to the significance of the inflorescence as an important criterion for subdividing the family into two tribes, the Commelineae and the Tradescantieae, and for delimiting genera. The ultimate units of the inflorescence in the Commelineae are individual one-sided cymes (scorpioid) which may be solitary, variously compounded, or even reduced to a single flower. In the Tradescantieae, however, the cymes are paired and sessile, and the inflorescence, therefore, appears two-sided.

Callisia repens and the species associated with it in this summary belong in the Tradescantieae. Within the tribe, Callisia appears to be set apart, by a combination of characters, from other genera having distinct petals:

paired cymes sessile or subsessile in the axils of leaves or bracts along the stem (or in axils along stem and branches when the inflorescence is branched), or pedunculate, but then with a sessile or subsessile pair of cymes also in the same axil;

pedicels short, not exserted, scarcely equalling the generally prominent subtending bractlets, sepals elongate, acute, paleaceous, with a prominent more or less keeled midnerve and hyaline margins;

stamens 3-6 with glabrous filaments, those opposite the petals longest or the only ones developed;

ovary pilose at the apex, narrowed into an elongate filiform style capped with a brush-like (penicilliform) or rarely a broadly capitate stigma.

Callisia will not be confused readily with those genera in which the pedunculate cymes are subtended by a pair of prominent leafy bracts - Campelia, Rhoeo, and the typical species of Tradescantia. Species of Tripogandra and some of the tropical species of Tradescantia that have not received the study due them are not as readily distinguished from Callisia at first glance. They differ in the presence of well-developed pedicels exserted beyond and much exceeding the often small and membranous bractlets and in the soft,

Fig. 27. Callisia elegans in flower at the New York Botanical Garden, November, 1947. Courtesy of E. J. Alexander.

often colored sepals. The pedunculate paired cymes of Tripogandra are apparently never accompanied by a sessile or subsessile pair of cymes from the same leaf axil. Other differences in floral structure, though important, are less readily discerned.

Persons familiar with Matuda's study referred to earlier will note the absence below of three species which he retained. Callisia monandra and C. multiflora have been cultivated in Europe though neither is offered currently in the United States. They were placed in a section apart from Callisia repens by C. B. Clarke in his monograph of Callisia (in A. & C. DeCandolle, Monographiae Phanerogamarum 3: 309-313, 1881), a treatment followed (as section Leptocallisia) in Bentham and Hooker f., Genera Plantarum 3: 854, 1883. Callisia cordifolia has been transferred to the genus more recently by Anderson and Woodson in Contributions from the Arnold Arboretum of Harvard University 9: 117, 1935.

The last, because of its prominently pedicellate flowers, pedunculate paired cymes unaccompanied by sessile axillary cymes, soft, often colored sepals, glabrous ovary, and briefly trifid stigma, seems to find its closest relationship with Tripogandra, perhaps as merely a species of that genus, but more likely to be retained in a distinct genus with the name Leiandra cordifolia (Swartz) Rafinesque. Regardless of its ultimate disposition, I do not find it possible to retain it in Callisia as defined here.

The first two species were separated from Callisia and removed to the genus Leptocallisia (Bentham & Hooker f.) Pichon in Notulae Systematicae 12: 225, 1946. Monsieur Pichon, who appears to have studied the genera of Commelinaceae without reference to Woodson's work, stated that the cymes of Leptocallisia are double (and simple in Callisia!). Contrary to Pichon, the pedunculate cymes of Leptocallisia are not paired but are simple. The flowers have well-developed pedicels. Thus the genus belongs in the Commelineae as defined by Woodson. The episepalous stamens with elongate anthers and narrow connective, together with other floral characters, may be sufficient to keep Leptocallisia separate from Aneilema with which it appears to have its closest relationship. Careful study of a complex assemblage of species is necessary, however, before a final disposition is made. The two species are, however, excluded from Callisia as I define it.

Callisia Linnaeus, in Löfling, Iter Hispanicum 305, 1758.

Hapalanthus Jacquin, Selectarum Stirpium Americanarum Historia 11, 1763.
Spironema Lindley, in Edwards's Botanical Register 26: t. 47, miscellany 26, 1840, not Spironema Rafinesque (1838).
Rectanthera Degener, Flora Hawaiensis 1: Family 62, 1932.

Callisia is a genus of eight species concentrated in Mexico and British Honduras but with one (C. repens) ranging through the West Indies and Central America to northern South America. Plants are creeping herbs with alternate ovate to oblong-lanceolate leaves which become progressively smaller toward the tip of the stem, eventually being reduced to bracts. The leaf sheaths are united around the stem. Flowers are borne in paired sessile cymes in the leaf axils or in axils of bracts along the stem and branches or on peduncles (in reality, apparently, branches reduced to a single terminal pair of cymes) from the axils but the peduncles then accompanied by a sessile pair of cymes in the same axil. Prominent acute, often vestite, bractlets subtend and usually exceed each short to very short pedicel, these latter not exserted. The three paleaceous sepals are acute, with a single median nerve which often forms a low keel, and with hyaline margins. Petals are white, pink, or blue, narrow and scarcely longer than the sepals in some species, nearly twice as long as the sepals with a prominently expanded blade in others. Stamens number 3 or 6, always with a smooth filament and nearly square to triangular broad connective separating the small longitudinally dehiscent anthers. The 2- or usually 3-celled ovary, which is pilose at the apex, has 2 ovules in each cell. A brush-like (penicilliform) or rarely broad-capitate stigma caps a long filiform style. The fruit is a loculicidal capsule with 2-3 valves and usually 4-6 seeds. Chromosomes of three species, C. elegans, C. fragrans, and C. repens, have been reported as n=6.

1. Petals longer than the sepals, expanded into a conspicuous spreading blade.
   2. Flowers white.
      3. Plants velutinous throughout; leaves striped with dull greenish-white on the nerves above. . . . . .1. C. elegans
      3. Plants essentially glabrous; leaves green. . . . . 2. C. MacDougallii
   2. Flowers pink.
      4. Stigma brush-like; plants densely puberulous. . . . . 3. C. Gentlei
      4. Stigma broadly capitate; plants glabrous. . . . . .4. C. tehuantepecana
1. Petals not or scarcely exceeding the sepals, inconspicuous and not expanded into a blade.
   5. Ovary bilocular. . . . . 5. C. repens
   5. Ovary trilocular.
      6. Flowers blue. . . . . 6. C. insignis
      6. Flowers white.
         7. Inflorescence normally branched; leaves to 20 cm. long and 4 cm. wide; connective of the anthers nearly square. . . . . .7. C. fragrans
         7. Inflorescence unbranched; leaves less than 10 cm. long; connective of the anthers triangular or nearly so. . . . .8. C. soconuscensis

1. Callisia elegans Alexander, new species[1]

Setcreasea striata Hortorum, in Graf, Exotics ed. 2: 66, 1954 and following editions, and Exotica 239, 1957; Gartenwelt 55: 112, 1955; in Encke, Parey's Blumengärtnerei 1: 216, 1957. Nomen nudum.

Setcreasea Groegeriana Hortorum ex Encke, Parey's Blumengärtnerei 1: 216, 1957. Nomen nudum, in synonymy.

The stems of Callisia elegans may reach a length of 60 cm. or more. They branch from near the base or nearly throughout, the branches emerging from the orifices of the sheaths. The internodes are green or irregularly flushed and lined with red-purple. The nodes are generally slightly swollen, measuring about 6 mm. in diameter. The entire plant, exclusive of the flowers, is densely white-puberulent (under a lens) and softly velvety to the touch. The stiff, succulent leaves are alternate and two-ranked along the stem, more or less crowded on new shoots but separated by as much as 7 cm. on old growth. The sheath is short, not inflated, 5-8 mm. long, green, and provided with long, often more or less matted, pale hairs at the orifice. Blades are ovate to usually broadly lanceolate from a rounded to subamplexicaule base, tapering to an acuminate tip. The smallest may be only 1.5 cm. long and 1.2 cm. wide, but the usual blades measure 5-7.5 cm. long and 2.2-2.9 cm. wide. In addition to the dense coat of short hairs, the margins are stiffly ciliate. The upper surface has a thick translucent layer of cells in beaded arrangement, paralleling the nerves, through which appear 3-4 prominent and 1-2 less conspicuous very pale green nerves on each side of a broader pale midnerve against a ground color of rather dark green; the lower surface may be nearly green but is more commonly flushed with red-purple, or completely purple when grown in strong light; the margins are green or narrowly outlined in red-purple.

Each short branch and each major shoot terminates in an inflorescence 6-15 cm. long composed of 4-6 flowering nodes with puberulent bracts or, at the lowermost, a reduced leaf. One or frequently two pairs of cymes appear at each flowering node; when two cymes develop, one is usually sessile or nearly so, the other on a peduncle to about 1 cm. long. Sometimes slender flowering branches appear from the lower nodes of the inflorescence. Individual cymes consist of 4-5 flowers, the adaxial flowers developing first. The innermost flowers are very shortly pedicellate, the outer nearly or quite sessile, but neither the pedicels nor the sepals exceed the subtending bracts and bractlets. The paleaceous keeled sepals are 6.5 mm. long, green with a hyaline margin and

[1] Plantae dense et minute velutinosae, caulibus repentibus, foliis superne leuco-nervatis, inferne purpureis, floribus albis et petalis magnis.

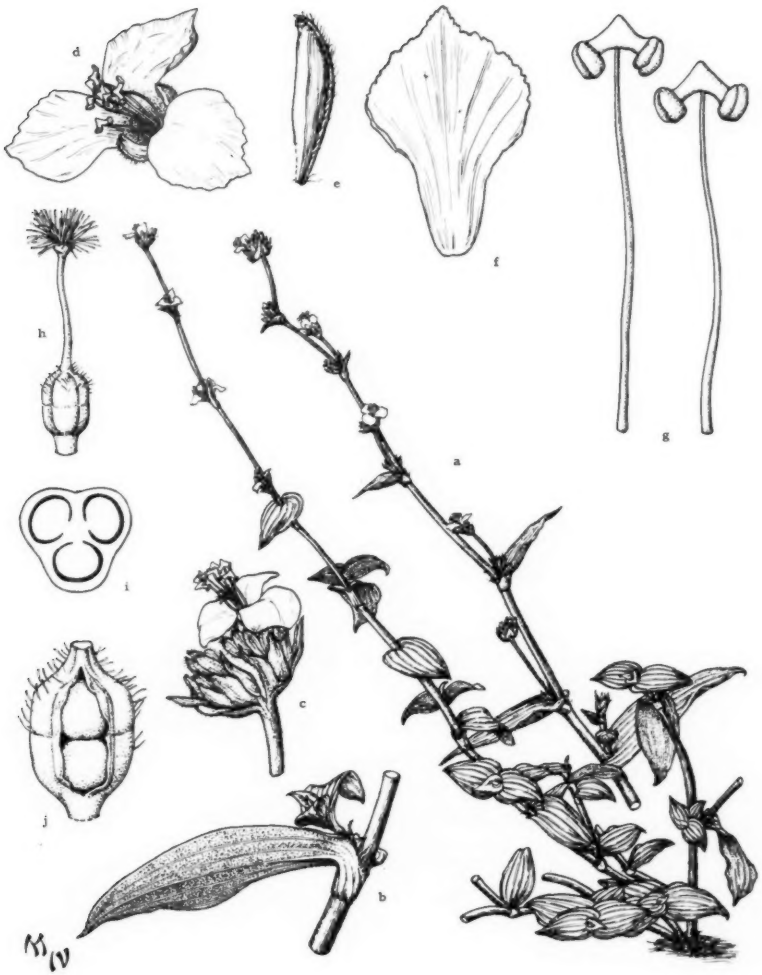



Fig. 28. Callisia elegans: a, habit with inflorescences in two stages of development x 1/2; b, node and branch x 1; c, paired cymes slightly separated x 2; d, flower x 3; e, sepal x 4; f, petal x 4; g, stamens x 8; h, pistil x 8; i, ovary in cross-section x 15; j, ovary with section of outer wall removed x 15.

a red-purple tip, the keeled portion being puberulent. The white petals, to 9.5 mm. long, 6.5 mm. wide at their broadest point, expand into a spreading broadly ovate tip above a narrowed base. The stamens are of unequal length, those opposite the petals being longer. The white filaments are glabrous; the pale yellow or white anthers are widely separated by a broadly deltoid white connective with spreading arms. A white trilocular ovary contains 2 ovules in each cell and is pilose at the apex, where it narrows to the glabrous filiform style. The stigma is brush-like (penicilliform) and white. Seeds have not been obtained and it is assumed that cultivated material is a self-sterile clone.

Cultivated at the New York Botanical Garden, but originally introduced in April 1943 by Thomas MacDougall from near Tehuantepec, Oaxaca, Mexico, December 1943, E. J. Alexander (NY, holotype); cultivated at Cornell University, Ithaca, New York, December 1957, H. E. Moore 7565 (BH, MEXU, NY, paratypes).

Within its group of allied species, Callisia elegans most closely resembles C. MacDougallii from central Chiapas. Both have pedunculate cymes and large flowers with white petals much exceeding the sepals and enlarged into spreading broad blades; both have similar ovary, stigma, and style; stamens are similar although apparently the connective in C. elegans is produced in a longer and sharper point. It would appear that C. elegans may also develop short, densely leafy stems that would, in nature, persist through the dry season, but the relatively constant conditions of a greenhouse obscure this characteristic. It is especially in the foliage of the two species that striking differences appear. Callisia elegans is densely pale-puberulent throughout. Stems, leaves, bracts, sepals are all clothed with very short erect pale hairs so that all parts are velvety to the touch. Leaf blades have a thick translucent layer of cells on the upper surface through which a broad very pale green midnerve, three to four conspicuous and one to two very thin similarly colored lateral nerves on each side may be seen. These pale nerves appear to be constant features of the foliage in all stages. The lower surface, however, is usually vinous with a slightly deeper color on the slender but well-marked nerves. Callisia MacDougallii is essentially a glabrous species according to the description, with the deep green leaves unmarked by pale nerves.

It has been noted during observation of plants at Cornell that the terminal pair of cymes is first to flower. Peduncles of cymes at successive nodes below continue to elongate, the cymes then commencing to flower in sequence down the stem (and down the branches when these are produced in the lowermost axils) with ordinarily only one flower opening at one time in each cyme. Flowering appears to be related to day length as plants normally bloom annually from October to December at Ithaca, New York, from

November to January at New York City. Four to five buds compose each cyme in a pair and the first peduncle is followed by a second or even a third at many nodes, excepting the terminal.

Chromosomes of Callisia elegans have been reported as n=6 by Robert Celarier (Bulletin of the Torrey Botanical Club 82: 31, 33, 1935). The plants studied by Celarier were listed as a species of Callisia of unknown origin, presumed to have come from Mexico. The brief description provided on page 33 of the reference cited, however, is unmistakable. An independent count by R. E. Lee of the Department of Floriculture and Ornamental Horticulture at Cornell University in October, 1957, confirmed the number. According to Celarier, the species differs from Callisia fragrans and C. repens - both of which have six pairs of medium-sized chromosomes, two with sub-median, four with sub-terminal constrictions - in having only one chromosome with a median constriction.

2. Callisia MacDougallii Miranda in Matuda, Anales del Instituto de Biología 26: 65, 1955.

This species is similar to C. elegans in habit and flower but differs, according to the original description, in being essentially glabrous and in lacking the pale nerves so prominent in the leaf of C. elegans. It comes from the rocky slopes of El Sumidero at 1200 meters altutude near Tuxtla Gutierrez, Chiapas, Mexico and has been cultivated in the Botanical Garden at Tuxtla Gutierrez. The short stems which serve to keep the plant alive during dry periods, and which also form in C. elegans, were first described for C. MacDougallii. The species was named after Thomas MacDougall who brought it to the attention of Dr. Miranda.

3. Callisia Gentlei Matuda, Sociedad Botanica de Mexico, Boletin 17: 4, 1954 [as C. Gentlea].

Stems of C. Gentlei are rather robust, probably ascending to erect in flower, to 7 dm. long, and covered with a dense coat of very fine soft hairs, as are the leaves and bracts, though these were originally described as smooth. The lanceolate leaves are 4-8 cm. long, 1.5-2 cm. wide, with ciliate sheaths. Pink flowers appear in pedunculate paired cymes from the upper leaf axils and bracts, the sepals measuring about 4 mm. long, the petals to 6.7 mm. long with an expanded rounded blade 4 mm. wide. The six stamens have anthers broader than high. The 3-celled ovary is sparsely pilose at the tip, narrowed into a slender style and a brush-like stigma.

Thus far, C. Gentlei is known only from Vaca, in the El Cayo District of British Honduras. It resembles C. elegans in habit but is distinctive in its pink flowers. The original description notes that stems and leaves are glabrous but an examination of an isotype

at the Gray Herbarium suggests otherwise, for the specimen, like C. elegans, is densely and minutely velutinous nearly throughout when studied under a lens.

4. Callisia tehuantepecana Matuda, Anales del Instituto de Biología 27: 356, 1956.

Pink-flowered C. tehuantepecana is apparently very similar to C. Gentlei, from which it appears to differ in its broadly capitate stigma, in its glabrous stems, foliage, and ovary, and sessile or shortly peduncled cymes. This species is known thus far only from Limón, near Tehuantepec in the state of Oaxaca, Mexico. The description is drawn from that of Matuda.

5. Callisia repens Linnaeus, Species Plantarum ed. 2: 62, 1762.

Hapalanthus repens Jacquin, Selectarum Stirpium Americanarum Historia 11, t. 11, 1763.

Tradescantia Callisia Swartz, Flora Indiae Occidentalis 1: 603, 1797.

Spironema Robbinsii Wright & Sauvalle in Sauvalle, Flora Cubana 158, 1873.

Plants of C. repens are delicate creepers with slender glabrous (except for lines of short hairs) dark stems branching and reaching lengths of more than a meter (in cultivation). The bright green thin leaves are ovate, to 2.5 cm. long, 1.5 cm. wide, margined with short hairs. Leaf sheaths are often longitudinally striped and villous at the apex. Inconspicuous sessile white flowers are borne in sessile cymes from the upper leaf axils and bracts, the sepals measuring 2-3 mm. in length, the petals usually less. Three to six stamens bear anthers with a broad connective. The 2-celled ovary is pilose at the tip with a slender style and brush-like stigma.

Callisia repens is the most widely distributed species of the genus, occurring nearly throughout the West Indies, in Mexico, Central America, and south to Brazil and Peru. It is occasionally cultivated in the United States as a basket plant when the slender stems attain a length of as much as two meters. Plants cultivated in Europe as C. repens are likely to be Leptocallisia multiflora, while the true C. repens has appeared there erroneously called Tradescantia venezuelensis according to W. Ludwig (Die Gartenbauwissenschaft 21: 439-440, 1956). Stems creep and branch, forming mats in the wild state, which suggests its possible use as a ground cover. During dry periods the leaves assume a grayish cast, at least in Hispaniola.

Although C. repens is the type of the genus, it is the least typical of the species in several respects. The bilocular ovary contrasts with the trilocular ovary of other species. The cymes, especially toward the tip of the stem, are frequently reduced to only

one or two flowers and sometimes one cyme is suppressed altogether. Bractlets are less obvious than in other species, occasionally being very much reduced. An examination of cymes at the lower axils of vigorous plants, however, shows them to be paired.

The number of stamens has usually been reported as three but six is perhaps the more common number in the material I have studied. When the exserted stamens of open flowers dry they tend to form a mass about the stigma. Superficially there appear to be three anthers but dissection often shows six. There are, however, flowers with only three stamens. The withered flowers in the greater proportion of herbarium material already contain a fully matured capsule and seldom can the number of stamens be determined. There is some indication, however, that six stamens may be associated at times with an abortive ovary especially in the youngest flowers. A study of living material from various parts of the range is most desirable to afford a satisfactory explanation.

6. Callisia insignis C. B. Clarke in Hemsley, Diagnoses Plantarum...Mexicanarum et Centrali-Americanarum 3: 56, 1880.

Stiffish, rather succulent stems with a bluish cast reach a length of 4 dm. and bear ovate-lanceolate leaves to 3.5 cm. long, 1.5 cm. wide. Plants are essentially smooth except for lines of short hairs on the striped leaf sheaths and on the margins of the bluish-green leaf blades. The blue flowers are sessile or nearly so and congested in sessile paired cymes in the upper leaf axils or in axils of bracts at the top of the stem. The sepals are 3-4 mm. long, not much exceeded by the bright petals. Three stamens bear nearly square anthers with a broad connective. The 3-loculed ovary is hairy at the tip, narrowed into a slender style and brush-like stigma.

The highlands of east central Mexico are the home of this species which warrants trial in horticulture. Striped leaf sheaths as well as bright though small flowers make plants ornamental in leaf and in flower.

7. Callisia fragrans (Lindley) Woodson, Annals of the Missouri Botanical Garden 29: 154, 1942.

Spironema fragrans Lindley, Edward's Botanical Register 26: t. 47, miscellany 26, 1840.
Rectanthera fragrans (Lindley) Degener, Flora Hawaiiensis 1: Family 62, 1932.
Spironema orthandrum Lindberg, Acta Societatis Scientiarum Fennicae 10: 127, t. 4, 1875.

Stems to 1 meter long are fleshy, lax, and often branched, bearing long stolons at the base. The leaves are elliptic-lanceolate, to 25 cm. long, 4 cm. wide. A branched inflorescence ter-

Fig. 29. Callisia fragrans cv. 'Melnickoff': a, habit x 2/5; b, flower x 5; c, stamen x 8; d, pistil x 8.

minal on each stem is crowded with bracted sessile cymes of fragrant white flowers scarcely longer than the bractlets subtending them. Six stamens are present, these with the connective of the anthers nearly square. The 3-loculed ovary is pilose at the apex and the stigma is brush-like on a long slender style.

This species is native from Veracruz to Yucatan in eastern Mexico where I have seen it (in Veracruz) growing in pockets of humus on lime ledges, the stems straggling. In cultivation it is frequently used as a basket plant with the coarse stems pendulous but arching upward as the inflorescences develop. Propagation is by cuttings, as seed is rarely produced. A cultivar with leaves longitudinally striped with white or pale yellow or brown has been offered under a name of no botanical standing (Spironema Melnickoffii). It may be termed cv. 'Melnickoff'. The leaves are not constantly striped; the stripes appear generally on propagations but frequently disappear in age or they may persist on old stems but be lacking on new growth.

8. Callisia soconuscensis Matuda, Sociedad Botanica de Mexico, Boletin 17: 2, 1954.

The glabrous stems, lanceolate leaves, and sessile cymes and flowers of this species appear from Matuda's description to be much like those of C. fragrans in aspect but smaller in size, the stems reaching 4 dm. in length, the leaves only 6-8.5 cm. long, 1.5-2 cm. wide. The inflorescence is unbranched. A differently shaped connective of the anther appears also to distinguish C. soconuscensis from its relative. The connective is deltoid or nearly so and, as illustrated by Matuda, is not much broader than the anther sacs. The connective of C. fragrans, in contrast, is nearly square and broader than the anther sacs. Callisia soconuscensis is known only from the margins of woods near Esperanza, Escuintla, Chiapas, Mexico at an altitude of 200 meters.

# Horticultural Progress during Liberty Hyde Bailey's Lifetime[1]

Harold R. Fletcher
Royal Botanic Garden
Edinburgh, Scotland

I think there can be no doubt but that Liberty Hyde Bailey was one of the most favoured children of the gods. They predisposed that he should be the leader in horticulture of a great continent; that often he should speak with the tongue of a prophet; and that he should enter the world at exactly the right moment - the year 1858, the year in which Charles Darwin was to read before the Linnean Society in London his paper "On the Variation of Organic Beings in a State of Nature" and the year before he was to publish "The Origin of Species by Means of Natural Selection."

Thus all Darwin's works were available to the youthful Bailey as well as Asa Gray's exposition of these in his book Darwinia. Right from the beginning, therefore, Bailey was in the thick of the Darwinian revolution and quite clearly he saw, as apparently few others did, that Darwin's epoch-making conclusions had been derived largely from a study of cultivated plants. This was the key to Bailey's future.

By the time he was twenty he was a student at Michigan State Agricultural College and was under the stimulating influence of one of Asa Gray's former students, Professor Beal, who in 1878 was breeding new varieties (I suppose I should say cultivars) of potatoes, and conducting hybridization experiments with apples. In 1883, at the age of 25, Bailey was Assistant Curator of the Harvard University Herbarium with entire charge of the nomenclature of the plants of the gardens and of the garden herbarium, as well as Assistant in Physiological Experiments. He was, in fact, the personal assistant of Professor Gray (honor indeed for a youngster) and it must have been an enriching experience to him to discuss arboricultural and floricultural problems with the master - and no doubt something of the same experience for the master to discuss with his assistant de Candolle's stimulating book The Origin of Cultivated Plants, which had just been published.

After only two years with Gray, this brilliant young man who was so deeply engrossed in living plants and their cultivation and behaviour in the garden; who realized that in the garden evolutionary problems could be studied and that cultivated plants threw

[1] An address delivered at Cornell University, March 14, 1958, on the occasion of the celebration of the Liberty Hyde Bailey Centennial.

abundant light on variation and descent; who was passionately keen on crop improvements and in the introduction of new varieties; who regarded horticulture as the handmaid of botany; who had told his master Gray that a horticulturist needs to be a botanist (to which Gray had replied, "Yes! but he needs to be a horticulturist as well"); after two years then - in 1885 - Liberty Hyde Bailey was appointed to the Professorship of Horticulture & Landscape Gardening in the Michigan State Agricultural College - henceforth to lead the American world of horticulture as had Gray the botanical world.

Now this was at the time when the United States Department of Agriculture was catching the eye with its pioneering work on plant diseases. But Bailey's main interests lay elsewhere - in the originating of new races of cultivated plants and in their taxonomic study. By 1890 he was making experiments with Coleus, Phlox, Silene, Mimulus and other plants to show the extent to which colour could be regulated by hybridization. A year or two later he was urging that greater attention should be given to the development of the petunia, foreseeing the great horticultural potential of this plant although at this time not envisaging $F_1$ and $F_2$ hybrids and such remarkable development as the present day Carnival Strain. He was preaching the gospel, and continued to do so, of the need for a far wider and more divergent range of new plant material, regarding each new cultivated species or new cultivar not simply as a final unit in itself but as a starting point for still further development; and he was preaching the gospel of the need for an explorer with the training both of a botanist and of a gardener and with an eye for a new plant suitable for the American continent. And surely it is significant that, by the end of the century, the Office of Seed and Plant Introduction and Distribution of the United States Department of Agriculture had been created under the direction of David Fairchild, who was himself to make a world-wide tour with the object of introducing new plants and who was to induce others to go to Africa, Asia, South America, the Pacific Islands, and Europe on the same mission.

Now I would like for a moment to consider the range of plant material which was in cultivation in North America at the turn of the century, confining my remarks to ornamental plants of a hardy nature.

During the eighteenth and nineteenth centuries several splendid gardens had been developed. In 1728 John Bartram had established a botanic garden near Philadelphia wherein he cultivated many American trees and shrubs collected on his travels from Lake Ontario to Florida, as well as a few plants, such as the horse chestnut, imported from European gardens. The Linnaean Botanic Garden had begun life as the nursery of Robert Prince at Flushing, Long Island, in 1730 and there in 1790 were to be seen specimens

of the Lebanon and Atlas cedars, Asiatic magnolias, the smoke tree, Koelreuteria paniculata, Laburnum anagyroides, Paulownia tomentosa, the copper beech, the snowball tree, and Hibiscus syriacus. There was the garden at Mount Vernon. There was the garden of William Hamilton at "The Woodlands" near Philadelphia (the site of the present Woodlands Cemetery) containing many exotics, including the first ginkgo to be planted in America (in 1784). There was the Elgin botanic garden of David Hosack, founded in New York in 1801, containing many European plants and a few Asiatics as well - Gleditsia sinensis, Rosa multiflora, Malus spectabilis, Hydrangea macrophylla, and, rather remarkable to me - growing under glass - Aucuba japonica! There was the botanic garden of Harvard University (now, of course, discontinued) with the Oriental arborvitae, Eriobotrya japonica, and the cut-leaved form of Vitex Negundo. There was the comprehensive collection of woody plants in the garden of the brothers Pierce at Longwood, now - largely, I believe, due to the foresight of Mr. Pierre du Pont - the wonderful garden with the tremendous future which you all know. There was the garden at Ithan Creek near Philadelphia, cultivated by the friend of the Hookers, Mr. John Evans, who received seeds of many of the Himalayan plants which Joseph Hooker collected. There was the excellent pinetum of Horatio Hunnewell at Wellesley. There were the introductions of such men as David Douglas, Coulter, Nuttall, Harbourg. There were the first Japanese plants to be sent direct to America: Magnolia Kobus, M. stellata [M. Kobus var. stellata], Hypericum patulum, Sciadopitys, Lilium auratum, and others - all introduced in 1861 by Dr. George Hall, whose garden was at Bristol, Rhode Island, where several of Hall's original trees still stand; and Magnolia parviflora, M. obovata, Cercidiphyllum, Symplocos paniculata - all introductions of Thomas Hogg, American Consul in Japan. And in the Arnold Arboretum, founded in 1872, there was a comprehensive collection of native American and of Asiatic species built up by the activities of Professor Sargent, who, in 1892, was able to visit Japan and to bring home, along with much else, what was to prove to be one of the most valuable introductions of the nineteenth century - Rhododendron Kaempferi.

And there were the nurseries of such men as the Parsonses - brothers Samuel and Robert - in Flushing, Long Island, making available to American gardeners many of the ornamental plants of European gardens, especially rhododendrons. This was the first nursery to propagate rhododendrons and azaleas in the United States. By the middle of the nineteenth century, the Parsonses were growing thousands of seedlings; 'Parsons' Gloriosum' was introduced before 1860 and 'Bertie Parsons' before 1870. As you well know, these are both R. catawbiense hybrids, and at that time most rhododendron hybrids were crosses of this species with R.

maximum, R. ponticum, or R. caucasicum. The Hooker rhododendrons of 1849-50 were in very short circulation and in any case were deemed unsuitable to the North American climate. But the rhododendron craze had begun: many hybrids - and even native American species - were being imported from England and from Holland; the first American book on rhododendrons - by E. S. Rand - had been published in 1871; and the first open-air exhibition of them was held in Boston two years later. Strangely enough, at the Columbian Exposition at the World Fair in 1893 there were very few American-grown rhododendrons and azaleas, although large exhibits from Boskoop, Belgium, Versailles, Dresden, and England caused quite a sensation. These exhibits convinced Bailey that "there is not a more promising field for the American Nurseryman than in the evolution of an American race of Rhododendrons and Azaleas." That was 65 years ago; the field is far more promising today than it was then.

Surely it is a most remarkable circumstance that in 1893, when rhododendrons and azaleas were represented in such large numbers at the Exposition, not a single species or cultivar of Camellia was on view. At any rate, I have found no record of one. Certainly they had been grown in considerable numbers since the 1820's, for then there were nurseries near Boston, New York, and Philadelphia specialising in the growing of C. japonica cultivars. And I believe that in the 1830's there was a nursery in Harlem, between 4th and 5th Avenues from 125th - 127th Street, growing an abundance of them. In the catalogue of Warren's Floral Saloon in Boston of 1845, 87 named cultivars, as well as several unnamed ones, were listed. It was this same Mr. James Warren, the proprietor, who moved to the Pacific West Coast with the Gold Rush and took the camellia with him. Thus, from being one of the most popular of greenhouse shrubs when a very wide range of cultivars was grown, the camellia had gradually lost favour by the close of the century.

No such fate attended the rose. The nineteenth century had seen the introduction of several native species as well as species from Asia and Asia Minor. There were Hybrid Perpetuals and Mosses; there were Hybrid Teas; there were the Scented Roses, the Hybrid Sweet Briars, the Climbers. And at the World Fair there were large exhibits, most of them from America, but some from Germany, Austria, France, Holland, and Ireland. Now for some time American rose-growers, aware that their products, from the point of view of the lasting qualities of the flower, compared unfavourably with those from Europe, had been producing hybrids to overcome this deficiency - hybrids of the Wichuriana, rugosa, and multiflora roses with those of American species and with the best of the cultivars in America. In 1889 - exactly 69 years ago yesterday - the American Rose Society had been organised "to increase the standard of excellence of the rose for all

the people" and later this enterprising and enlightened society was to establish trial gardens and later still a bureau of registration.

Of herbaceous plants during the nineteenth century, tulips and daffodils had become extremely popular and from about 1800 onwards vast quantities of bulbs were imported annually from Holland for forcing. Sweet peas, irises, dahlias, carnations, chrysanthemums - all these and more - were in great favour, their popularity having developed from about the middle of the century.

The carnation, for instance. From the time the French-raised perpetual-flowering carnation had been introduced into America about 1856, it had been a great success. The French cultivars 'Mont Blanc', 'La Purité' and 'Mantreaux Royal' had been hybridised and within a year or two the first American hybrid, 'Mrs. Degraw', had been raised. A host of new breeders arose, a multitude of new cultivars developed, and in 1891 the American Carnation Society was organised. Three years later Bailey was made an honorary member of this Society. The outstanding name in the history of the development of the carnation in America before 1900 is, of course, that of Frederick Dorner who bred carnations for over 20 years, growing over 150,000 seedlings and producing a very fine strain. It was he who was the first to disbud them in the East and it was he who originated the method of supporting them by means of wires and cross strings.

The cult of the chrysanthemum ran a very similar course. Not a single cultivar was listed at the beginning of the century and it was not until the second half of the century that "the princess of flowers," as Bailey called it, attracted the attention of nurserymen and the public. It was not until 1846 that Robert Fortune introduced the Chusan daisy and thus paved the way for the development of the new race of pompoms. And it was not until 1861 that the same Fortune sent home seven new Japanese chrysanthemums to Standish of Bagshot, Surrey. "One had petals like long thick hairs, looking like the fringe of a shawl or curtain," said Fortune, who believed that they would create a new era in chrysanthemum-growing as had his modest Chusan daisy. And he was right. One of these Japanese-hairies, 'Mrs. Alpheus Hardy', was sold in America for $1500 and started the craze which led to the formation of the American Chrysanthemum Society in 1889, the same year as the Rose Society and six years before another Society - the Dahlia Society - was formed to advance the cause of the dahlia.

Thus it was at the close of the century. Quite clearly new plants were being introduced and new plants were being bred. But such breeding as had been done and was being done was mostly in the hands of a few enlightened amateurs and fanciers and nurserymen. This was not good enough for Bailey. As he was deploring the fact that not nearly enough organised breeding work was in pro-

gress, that it was still too much governed by chance or random discoveries and that it lacked scientific effort, the world of science was startled in 1900 by the now well-known triple rediscovery of Mendel's principle of segregation in hybrids, and in the following year still further startled by the announcement of de Vries' Mutation Theory, so different from Darwin's teaching, of explosive modification by which new species and cultivars arise suddenly. The dawn of the century certainly was epoch-making. Just as Mendel's work cut across many of the current notions regarding hybridisation and showed that the results of hybridising were not largely chance, so did de Vries demonstrate that evolution, in cultivated plants at any rate, was not necessarily the gradual and slow process it had been considered to be. And Bailey realised that at last the methods of trial and error were, or would be, at an end; the age of planned experimental work, of making accurate and statistical studies - the age which he had anticipated - had begun.

In 1901 the Bureau of Plant Industry of the United States Department of Agriculture was created. Soon two special sections of the Bureau were functioning: the Laboratory of Plant Pathology, with Bailey's life-long friend Erwin Smith in charge and with a programme of pathological research including the breeding of disease-resistant varieties; and the Laboratory of Plant Breeding in the charge of Herbert Webber, whose staff were among the first to undertake Mendelian and de Vriesian investigations. Webber, of course, was later induced by Bailey to leave Washington and to go to Cornell, there to establish the first Department of Plant Breeding in this country. From this time forth, plant breeding became very much more than a practical art; it became, in fact, an integral part of the new science which the application of the work of Mendel and de Vries had created - the science of Plant Genetics.

A year or two later a new station for Experimental Evolution was established at Cold Spring Harbor, Long Island, and here George Shull, close associate of Bailey for more than half a century, began his experiments with corn which were to open up a new era in maize breeding. Whereas in the past progress in breeding had been by use of mass selection, Shull proposed an entirely new approach - a method of first isolating pure lines and then crossing them to give a vigorous hybrid whose heredity could be absolutely controlled. It was now possible definitely to plan the combination of characters in a hybrid to obtain almost any desired objective.

Thus, just as the plant breeder had laid the foundation for the study of genetics, so genetics had opened up a new science - the science of heredity. Bailey's vision had materialised. Horticulture, and especially plant breeding, at last had been uplifted into a science. Now, more than ever, was it necessary to have a far wider and more divergent range of plant material for experimental

purposes, as starting points for new developments; now, more than ever, was it necessary for the right type of collector to go forth into the wild in search of new material.

And, of course, the collectors were there to answer the call and the material was forthcoming - as never before and probably as never again in the history of horticulture. Since 1900, at least as many species have been named and described as were known up to that time. In 1902 the Cyclopedia of American Horticulture described 8,793 species; the Standard Cyclopedia of Horticulture of 1917 dealt with 20,602 species. (By the way, how easy it is to prepare an address of this nature with two such works available!) Between 1930 and 1955 close on 70,000 species have been described, species which, in the main, have been collected in hitherto botanically unexplored areas of nearly all our continents.

By way of illustration, allow me to consider briefly just one of these areas - an area the flora of which is rather more familiar to me than any other - south-western China. By 1900 some idea of the richness of the flora of this region had been made known to the Western World. The collections of Augustine Henry from the western areas and of the French missionaries David, Soulié, and Delavay from Szechwan and Yunnan offered abundant evidence of this. But the evidence was in the form of dried material in various herbaria. After 1900 it was different. George Forrest, for instance, was not only sending home some of the most beautiful herbarium specimens ever collected, but pounds of seeds as well. "Primulas in profusion, seeds of some of them as much as 3-4 lbs.," he wrote. It was much the same with the rest. The two important names from your point of view are, of course, E. H. ("Chinese") Wilson and Joseph Rock - though we must not forget Frank Meyer. But many of the introductions of the others - Forrest, Kingdon Ward, Farrer, Purdom - also found their way to you. You all know so many of the wonderful plants, so many of them new to science, which these men brought into cultivation - new species of Saxifraga, Androsace, Delphinium, Primula, Gentiana, Meconopsis, Aster, Salvia, Astragalus, Daphne, Potentilla, Cotoneaster, Rosa, Spiraea, Berberis, Viburnum, Rhododendron, Vaccinium, Magnolia, Abies, Juniperus, Betula, and hosts of others. All this material was and still is to transform the face of our gardens - until now, possibly more so our gardens than yours - for not only was much of it eminently suitable for cultivation, but all of it served to augment the stock of material for experimentation and to increase the pool of genes on which progress in breeding is dependent.

Finally, I must discuss the question as to how far experimentation has taken us. What degree of further development has there been? I can but touch upon one or two groups of plants with which I am a little familiar.

As yet the development of the rhododendron has not been so spectacular as one would have expected, for the new rhododendrons have not been the unqualified success in your part of the world as they have in mine. I gather that still the most popular in commerce today are such cultivars as 'Pink Pearl', introduced at the turn of the century, as well as some of the Waterer hybrids of the 1860's, and that thirty to forty years after their commercial introduction 'Britannia', 'Mrs. Lindsay Smith', and the like are at last coming into favour. And yet hundreds of thousands of seedlings, both of species and of hybrids, are being grown all over the States, and there can be no doubt at all but that continual breeding for increased hardiness, or for increased resistance to drought, will produce an abundance of good horticultual plants for the future. In fact, a beginning has been made: by the late Mr. Charles Dexter with his hybrids of the Fortunei series; by Mr. Guy Nearing, by Dr. Clement Bowers, and by others; by Dr. Morrison and his colleagues at the United States Plant Introduction Garden with the Glenn Dale hybrid azaleas of nearly 500 named clones which have gone some distance in extending the range of hardiness of the azaleas of the obtusum subseries, and consequently the range of their horticultural use. It is the same with the Gable Hybrids; the same with the Beltsville Hybrids. All this is only the beginning, however; the field is open wide for experimentation and great tasks lie ahead in making available hardy cultivars of many desirable Asiatic plants. And although I appreciate that in the past, even in the immediate past, the individual has done truly remarkable work - one thinks, for instance, of Dr. Frank Skinner's work with lilacs and Philadelphus, with poplars and willows, with roses and rhododendrons - yet, I am convinced that the tasks ahead are too great for the individual and that only through scientific teamwork can such work be brought to a successful conclusion.

What of the camellia? The story is rather different. Since 1900 there has been a renewal of interest in the cultivars of those species which were in cultivation before the turn of the century - japonica, Sasanqua and the double form of reticulata - and that most excellent handbook of your Camellia Society, "The Camellia," bears ample testimony to the variability, the plasticity of these species, as well as to the nation-wide interest in them. More recently, as a result of Forrest's introductions from China of C. saluenensis and the wild form of C. reticulata, you have been cultivating the beautiful C. × Williamsii hybrids: 'J. C. Williams', 'Mary Christian', 'St. Ewe', 'Michael' (all C. saluenensis × C. japonica); 'Donation' (C. saluenensis × C. japonica 'Donckelarii'); 'Salutation' (C. saluenensis × the semi-double C. reticulata); 'Inamorata' (C. saluenensis × the single-flowered wild form of C. reticulata). The last 25 years have been wonderful ones for the camellia; in my

opinion the next 25 years can be more wonderful still. I have no fears at all that new camellias will not be forthcoming; but I do have fears, in fact I am terrified, of camellia names. The confusion already existing in these names - over 10,000 of them - as well as in the identification of the numerous cultivars, is appalling. Here is a genus crying aloud for international registration and there is no society here, in Europe, or elsewhere, which feels fitted to take over the onerous task. All his professional life Bailey pressed for accurate records and documentation and it is, I feel, utterly appropriate that Old Bailey's child has come to the rescue, and that the Hortorium, with a wonderfully handsome grant from the Longwood Foundation, is to produce an annotated international check list of camellia cultivar names. I think he would have been proud.

Truly remarkable progress has been made this century in the culture of the rose - and truly remarkable progress has yet to come - not only in this country, but in Europe as well. There has been a spectacular advance in the Hybrid Teas and the Hybrid Polyanthas - and during the last 25 years the creation of virtually a new group, the Floribundas - the result of crossing the old Polyantha roses of Europe with the Hybrid Teas by American breeders. You see, rosarians learned the lessons taught by the breeders of hybrid corn - and the result was, first, the German-raised 'Pinocchio', then in America the wonderful 'Fashion', and now the offspring of 'Fashion', 'Ma Perkins' - all with colour undreamed of 50 years ago. And today we are all excited by another new group - the Grandifloras, crosses between the Floribundas and the Hybrid Teas developed by Lammerts and typified by the wonderful 'Queen Elizabeth'. The cytology of garden roses is by this time pretty well known; man now can juggle almost at will with the elements of heredity and thus produce colours almost to order. What doesn't the future hold, indeed?

I must remind you of the development since 1900 of the lily, for it has an important bearing on my thesis. At that time the three recommended for general cultivation in North America were L. tigrinum var. splendens, L. speciosum, and L. tenuifolium - although there were in cultivation such natives as L. canadense, L. Parryi, L. superbum, L. pardalinum, L. Grayi, etc. and such Asiatics as L. auratum, L. japonicum, L. Henryi, L. longifolium - the Easter Lily - as well as the south European L. candidum. Only one hybrid was grown, L. ×testaceum, and even that wasn't then known to be a hybrid. But let us not forget that one other hybrid had been raised - and lost; your great historian, Francis Parkman, had crossed L. speciosum var. rubrum with pollen from L. auratum and the hybrid had been exhibited at the R.H.S. in London in 1879 under the name of L. ×Parkmannii. What has happened since 1900? In the first place, great use has been made of the variability of

such species as L. auratum and L. speciosum and now there are many named clones of these species as well as blood-red, yellow, and apricot clones of L. superbum. More important, some 45 species have been brought into cultivation and their impact on the lily grower has been enormous. And thirdly, many species have been hybridised with most spectacular results: L. Henryi crossed with the trumpets has given us the Aurelian Hybrids; L. tigrinum × L. ×hollandicum, the Mid-century hybrids; L. leucanthum, L. Sargentiae, L. Brownii, L. ×hollandicum are in the parentage of the Olympic Hybrids. Parkmann's cross has been successfully repeated at Beltsville (and elsewhere) and we have the Beltsville Hybrids. We have the Skinner Hybrids, the Preston Hybrids, the de Graaff Hybrids, and others.

I believe that it is to such scientific programmes of research as obtains under the direction of Dr. Emsweller at Beltsville in the breeding of lilies (and, of course, daylilies, rhododendrons, stocks, chrysanthemums, roses as well) that horticulture must look in the future; a programme which is concerned with all phases of culture - nutrition, propagation, pollination, pollen-storage, polyploidy, and the breeding of types better adapted to varying conditions.

Quite clearly, in recent years developments and improvements in cultivated plants have been great. As a result of techniques for inducing mutations - colchicine, x-rays, ultraviolet light, radioactive materials, low and high temperatures - of the use of hormones, of the acceleration of seed germination, of embryo culture, and of other techniques, plant breeding has been greatly speeded up. If we accept, as accept I think we must, that Vavilov's philosophy of breeding is the only tenable one, that all plant material must be examined from every point of view - cytological, genetical, physiological, pathological - then the way is clear. Plant breeding in the future must be in the hands not of individuals but of teams; teams of scientists, men trained in the disciplines of genetics, pathology, and physiology and, if possible, knowing a good plant when they see one. Unfortunately, to such a team there cannot in future be harnessed the man with the great wealth of plant knowledge, the man who fifty years ago, and even later, could move with equal ease among the cultivars of the florists' flowers as well as among the species of Carex and of palm - the old Bailey type; a type which is extinct among the scientists and nearly so among the amateurs and the fanciers. Even so, given the teams of scientists pooling their resources and breeding their many new plants; given the organized plant societies (of which this country has such a wealth) to introduce the new creations to the public; given more societies who will act as "tidiers-up" and who are willing to take over the registration of cultivars; given more check lists of the like of the azalea, lilac and holly lists; then, indeed, the future will be the entrancing one which Bailey visioned - Bailey who, like a Colossus, spanned the century of horticulture just one facet of which I have tried to sketch for you - so imperfectly, so inadequately.

# Notes on the Cultivated Compositae
## 1. Townsendia

William J. Dress

Townsendia is a genus of western North American composites of relatively minor horticultural importance; nearly all its members are small tufted spring-blooming plants suited only for the rock-garden, where their tidy small cushions of foliage and delicately-tinted daisies may appeal to the gardener who can appreciate beauty of a modest sort. Although the most recent monograph recognizes 21 species of Townsendia, only about a third of these are known to be or to have recently been available to gardeners through the American trade. Locally, plants of other species may occasionally be transplanted to gardens from the wild by wild-flower specialists, of course.

As a member of the tribe Astereae of the family Compositae, the genus is fairly closely related to such horticulturally more familiar and important genera as Aster, Erigeron, and Boltonia. These genera are distinguished technically on the basis of their pappus: in Aster and Erigeron this consists of fine capillary (hair-like) bristles; in Boltonia, of only several minute bristles together with 2 to 4 longer awns; in Townsendia, usually of several to many more or less equal bristles somewhat flattened at their bases (in one species, and in the ray florets of some others, the pappus is a short crown of small scales).

The genus first made its bow to science in 1823 when John Richardson described as Aster ? exscapus certain little plants he had collected at or near Carleton House (now Carleton), Saskatchewan, Canada. As botanist on an expedition led by Sir John Franklin, he reported his observations and findings in the Botanical Appendix to Franklin's Narrative of a Journey to the shores of the Polar Sea in... 1819-22. His use of the question mark after the generic name indicated that there was doubt in his mind that the new species actually should be assigned to Aster, and this doubt was vindicated by the erection by William J. Hooker in 1834 of a new genus to harbor it (Flora Boreali-Americana 2:16). Hooker based his concept of the new genus on the specimens collected by Richardson and on additional material collected in the Rocky Mountains by Drummond. He named it "in compliment to David Townsend, Esq.

of West Chester, Pennsylvania, who having imbibed the most ardent love of Botany from his friend and instructor Dr. Darlington of the same city, has devoted his leisure hours to the science with eminent success."

Hooker named the species itself, on which he founded the genus, Townsendia sericea, thus employing an epithet different from that used by Richardson. Since the name Aster ? exscapus had already been published for at least part of the material on which T. sericea was founded, however, T. C. Porter in 1894 revived Richardson's specific epithet for the species to form the name Townsendia exscapa. In doing so he was following the rule of nomenclature which directs that the specific epithet must be retained when a species is transferred from one genus to another - and this essentially is what took place when Hooker made Richardson's Aster ? exscapus a species of Townsendia.

Unfortunately, it happens that the plants in the Drummond collection were not of the same species as those in Richardson's. The name T. sericea, then, was actually based on a mixture of two different species. Because Hooker's description accords more closely with the specimens collected by Drummond (the plate published at the same time obviously depicts two of Drummond's very specimens), these were accepted as the type of T. sericea by Esther Larsen, who monographed the genus in 1927 (Annals of the Missouri Botanical Garden 14: 1-47). Richardson's plants retained the name T. exscapa (Richardson) Porter.

Miss Larsen's interpretation, however, cannot be accepted under the rules, as the genus's most recent monographer, John H. Beaman, has pointed out (Contributions from the Gray Herbarium 183: 1-151, 1957). Since the Richardson plants had been described and named earlier and had been included in Hooker's T. sericea, they must be taken as the type of T. sericea; and since T. sericea is the type species of the genus, and since T. sericea is rightly to be considered only a synonym of T. exscapa (as pointed out above), Townsendia exscapa (the Richardson element) therefore is to be taken as the type of the genus. When T. sericea became a synonym of T. exscapa, the Drummond element in Hooker's original composite "species" was left without a name, of course. To remedy this, Beaman has given to the species represented by Drummond's specimens the name of T. Hookeri.

The significance this confusion in nomenclature has for the horticulturist as well as for the botanist is in the use of the name Townsendia sericea. Strictly speaking, the name T. sericea Hooker is a synonym of T. exscapa (Richardson) Porter. However, because Miss Larsen interpreted it thirty years ago as applying to the taxon we now should call T. Hookeri, it has during that time

been accepted and used in that sense by botanists and by horticulturists. For that reason it is very possible that some plants or seeds offered under the name T. sericea in the horticultural trade, at present and in the past, are and have been T. Hookeri.

The key which follows has been adapted from that published in Beaman's monograph. It should enable one to identify any of the species of Townsendia likely to be encountered in cultivation and at present available from commercial sources or plant societies.

### Key to the Cultivated Species of Townsendia

1. Pappus of the disk (central) florets consisting of very short bristles and scales less than 1.5 mm. long; plants fibrous-rooted and rhizomatous or stoloniferous; receptacle conical. . . . . T. formosa

1. Pappus of the disk florets consisting of bristles longer than 2 mm. (rarely with shorter scales or bristles also); plants tap-rooted, not rhizomatous or stoloniferous; receptacle merely convex or flat.

2. Involucral bracts with stiff, almost bristle-like attenuate-acuminate tips. . . . . T. grandiflora

2. Involucral bracts with acuminate, acute, or obtuse tips, but not bristly-stiff.

3. Hairs on the achenes bifurcate or unevenly forked with one prong exceeding the other, not glochidiate by recurved prongs.

4. Ray-florets blue (rarely whitish or pinkish); involucral bracts acuminate, in 4-7 (mostly 5) series or rows. . . . . T. Parryi

4. Ray-florets white or pinkish; involucral bracts acute, in 3-4 (rarely 2) series or rows. . . . . T. florifer

3. Hairs on the achenes glochidiate or the achenes glabrous.

5. Involucral bracts linear to narrowly lanceolate, the tips acuminate or acute, in 5-7 series.

6. Bracts of involucre linear, acuminate, with a tuft of tangled cilia at the apex. . . . . T. Hookeri

6. Bracts of the involucre narrowly lanceolate, acute, without a tuft of cilia at the apex. . . . . T. exscapa

5. Involucral bracts broadly lanceolate, ovate, or obovate, the tips mostly obtuse, in 4-6 series. . . . . T. Rothrockii

Townsendia formosa Greene is better known in gardens abroad than in America, having been offered here only recently by one specialist. It is a relatively tall-growing perennial, with erect, typically unbranched stems 3 to 6 dm. high, each carrying a single head about 5 cm. across with rays white on the upper surface, purplish underneath. Coming from grassy slopes and meadows in the mountains of southern New Mexico and Arizona, it should succeed in gardens without the special attention given to drainage which is required by the other species, which grow naturally in drier, even arid habitats. Kearney and Peebles, in their Arizona Flora, have remarked of this species, "A very beautiful plant."

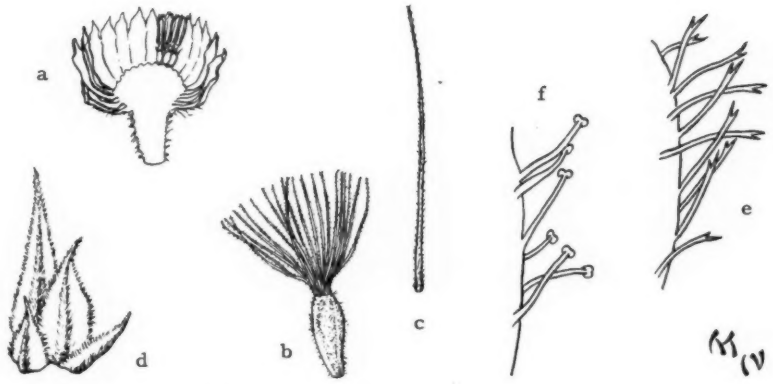



Fig. 30. a, head of Townsendia formosa in vertical-section and with most of florets removed, showing conical receptacle x 1; b, achene and pappus x 2, and c, single pappus bristle x 4 of T. exscapa; d, bracts from involucre of T. grandiflora x 3; e, bifurcate hairs on achene of T. Parryi x 28; f, glochidiate hairs on achene of T. exscapa x 48.

Townsendia grandiflora Nuttall, on the other hand, is a tap-rooted biennial, with lower, branched, spreading stems with somewhat smaller heads. The ray-florets are white, with a pinkish stripe down the underside. It is native to dry foothills, from southwestern South Dakota south to northern New Mexico.

Another tap-rooted biennial is T. Parryi D. C. Eaton, which ranges in nature from Wyoming and eastern Idaho northward into southern Canada. This is a handsome species, with large solitary heads to 6 cm. across on the one to few thick scape-like stems that stand erect, 0.5 to 3.5 dm. high, above the neat rosettes of spatulate green leaves. The rays are violet-blue, though, as in most flowers of this color, occasional individuals may vary to pink or white. Townsendia alpina (Gray) Rydberg, originally described by Asa Gray as var. alpina of T. Parryi, and offered a few times in the trade, is an apomictic form from high elevations which Beaman believes may be of hybrid derivation (T. Parryi × T. spathulata Nuttall).

Townsendia florifer (Hooker) Gray behaves as a winter annual or a biennial, and is tap-rooted. Sometimes the plant is low and compact, with single heads on short stalks, but sometimes the stems are branched and reach a height of 2.5 dm. The rays are

Fig. 31. Townsendia Rothrockii growing in the garden of the Bailey Hortorium.

white or pink. The natural range of T. florifer is from central Utah and western Nevada northwest to Oregon and Washington.

Whether T. Hookeri Beaman actually is or has been in cultivation is hard to say, for the name itself was published only last year in Beaman's monograph and so has not appeared in catalogues or horticultural literature previously, of course. The name T. sericea Hooker has been listed often, however, and it may be that some of the material sent out under this name has been what should now be called T. Hookeri. The reason for this has been explained earlier in this article. Townsendia Hookeri itself is a tap-rooted perennial with a crown of several short thick branches just under the soil surface, the whole forming a dense little cushion of narrowly linear, grayed leaves in which the (usually) sessile heads nestle. These last are 3 to 4 cm. across, with white rays often purplish-tinged on the under side. This species ranges from Colorado north into southern Canada.

Townsendia exscapa (Richardson) Porter is very much like the preceding species in general appearance, differing in technical characters as noted in the key. It is the most widely distributed of the townsendias in the wild, and the most frequently encountered

in commercial listings and in actual cultivation, though it is very modest in appearance, even for its genus. Some or much of the material listed under T. sericea is no doubt this species, or at least should be, since this name is merely a synonym of T. exscapa, as has already been pointed out. Townsendia Wilcoxiana Wood is another synonym of T. exscapa.

Though known and grown for some time in European botanical gardens, T. Rothrockii Gray ex Rothrock seems only now to be coming into general cultivation; it has recently appeared in the seed lists of both the American Rock Garden Society and the Alpine Garden Society (Great Britain). It comes from high altitudes in the mountains of western Colorado, where the growing season is relatively short, and this no doubt accounts for its precocious flowering - plants grown in the Hortorium garden have been among the first of spring flowers. This is another handsome species, with violet-blue-rayed heads about 4 cm. across, solitary on short peduncles above a cushion of oblanceolate green leaves. The crown is short-branched from a perennial taproot.

Finding List of Names in Townsendia

Townsendia

alpina (Gray) Rydberg :: placed in synonymy under T. Parryi by Beaman, who has said, however, that it appears to be of hybrid derivation (T. Parryi × T. spathulata).
exscapa (Richardson) Porter
florifer (Hooker) Gray
formosa Greene
grandiflora Nuttall
Hookeri Beaman
Parryi D. C. Eaton in Parry
Rothrockii Gray ex Rothrock
sericea Hooker :: T. exscapa (but in practice often incorrectly applied to what should now be known as T. Hookeri)
Wilcoxiana Wood :: T. exscapa

# Studies in the Cultivated Boraginaceae
## 2. Echioides and Arnebia

John Ingram

Popularity of garden plants, like the popularity of certain people, is subject to the fluctuation of the public's whims and the tastes of the times. This fact is exemplified by Arnebia decumbens and Echioides longiflorum, two rock garden plants which once were fairly widely grown in the United States, although they have not been extensively available in this country since the 'thirties.

These two species share certain characteristics which have led some botanists to believe that they are members of the same genus, a condition which is reflected in their invariable treatment in horticultural literature as species of Arnebia. Their affinities are also with Lithospermum; in fact, both have been included, at one time, in Lithospermum. The latest thinking is that the three genera should be maintained as distinct genera (Johnston, Journal of the Arnold Arboretum 35: 51-65, 1954).

Echioides longiflorum (C. Koch) Johnston, Journal of the Arnold Arboretum 35: 58, 1954. Prophet-flower.

Arnebia Echioides (Linnaeus) A. DeCandolle in DeCandolle, Prodromus 10: 96, 1846.
Arnebia longiflora C. Koch, Linnaea 20: 640, 1849.
Macrotomia Echioides (Linnaeus) Boissier, Flora Orientalis 4: 211, 1879.

This taxon is a typical member of the Boraginaceae in that it is a hairy herbaceous perennial, its flowering stems are about one foot tall from a basal rosette, with simple alternate leaves, and its flowers are arranged in a helicoid cyme which uncoils as the flowers mature (fig. 32). When the flower first opens, the corolla is yellow with a black or purplish spot at the base of each sinus between the lobes, but as the flower ages the spots tend to fade away, leaving the corolla entirely yellow (fig. 32, c and e). These spots appear to fade more quickly in the flowers of some plants than they do in others.

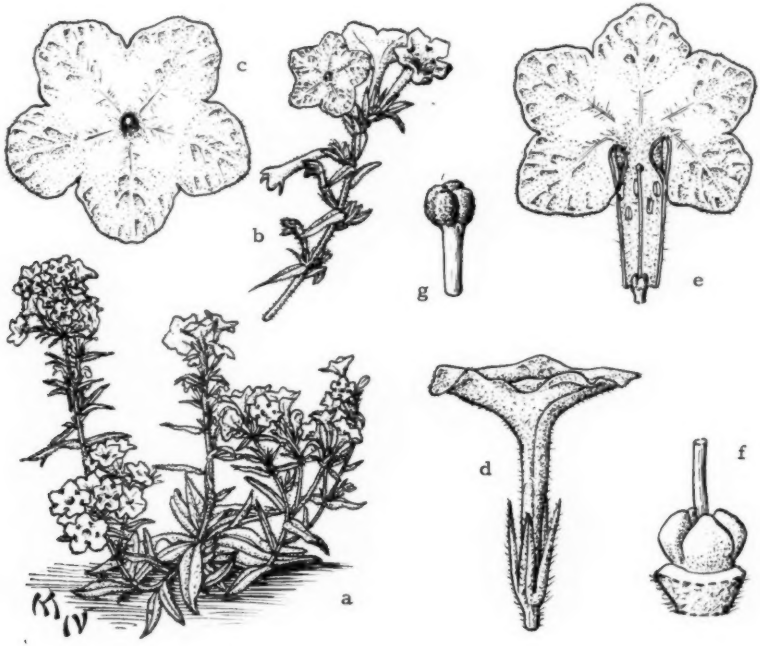



Fig. 32. Echioides longiflorum: a, habit x 1/3; b, inflorescence x 4/5; c, flower, face view x 1 3/5; d, flower, side view x 1 3/5; e, flower, vertical section x 1 3/5; f, ovary and base of style x 8; g, tip of style with two bilobed stigmas x 16.

Echioides is a native of Armenia and the Caucasus, and as defined by Johnston is a monotypic genus. Its sole species has been included, at various times, in at least six genera besides Echioides; however, it has been cultivated exclusively under the name Arnebia Echioides. The specific epithet was assigned by Linnaeus when he originally described the taxon as Lycopsis Echioides (Species Plantarum, ed. 2, 199, 1762). Koch, apparently unaware of the fact that Linnaeus had already named the species, described the taxon again as Arnebia longiflora. When Johnston finally transferred this species to the genus Echioides, the acceptable name became Echioides longiflorum because the tautonym Echioides Echioides is not allowable under the rules of botanical nomenclature.

Echioides longiflorum is separated technically from Lithospermum by its spotted corolla's being without appendages or glands in the corolla-throat, and its stamens' distribution at unequal heights in the corolla-tube (fig. 32e). The flowers are hetero-

stylic and the distribution of stamens is always irregular, appearing below the middle of the tube in long-styled flowers or in a zone below the top of the tube in short-styled flowers. In heterostylic flowers of Arnebia and Lithospermum, the stamens are always in one whorl regardless of whether the flower is long- or short-styled.

Arnebia decumbens (Ventenat) Cosson & Kralik, Bulletin de la Société Botanique de France 4: 402, 1857. Arabian-primrose.

Lithospermum decumbens Ventenat, Description des Plantes nouvelles et peu connues, cultivées dans le Jardin de J. M. Cels, t. 37, 1801.

Arnebia cornuta (Ledebour) Fischer & Meyer, Index Seminum... Horti Botanici...Petropolitani 1: 22, 1835.

Superficially, this species looks very much like Echioides longiflorum in its habit and yellow or orange flowers with their blackish evanescent spots which fade to maroon (fig. 33). As in Echioides longiflorum, the stamens are distributed at different levels within the corolla-tube, but, unlike it, Arnebia decumbens is homostylic. One obvious difference that becomes apparent as the flowers mature is that, with the maturation of the fruit, the calyx enlarges and envelops the fruit, forming a bur-like structure which falls from the plant with the four nutlets still enclosed. Another important difference lies in the style, which in Arnebia is twice-forked, bearing four subcapitate stigmas.

Arnebia decumbens was discovered, as an undescribed species, by Ventenat, whereupon he published for it the name Lithospermum decumbens. Almost sixty years elapsed before Cosson and Kralik transferred it to the genus Arnebia, but in the meantime this taxon was redescribed, this time by Ledebour (Flora Altaica 1: 175, 1829) as Lithospermum cornutum. Unfortunately, it has become established wrongly and quite consistently in cultivation as Arnebia cornuta. However, the specific epithet decumbens must be retained, since it was published earlier.

Species which grow natively over an extensive area tend generally to show more morphological variation among their members than do localized species having restricted ranges. As one might conjecture, with an overall range from Algeria to Afghanistan, Arnebia decumbens is no exception. In time, as more native collections are made and the individuals making up this complex species become better known, some of the elements now included in this species probably will be segregated into new species or subspecies.

The one decisive characteristic used by Johnston in defining the generic limits of Arnebia, Echioides, and Lithospermum lies in the morphology of their pollen grains. Arnebia is separable

Fig. 33. Arnebia decumbens. From Gartenflora 26: t. 921 (1877), as "Arnebia cornuta β grandiflora."

from Echioides and Lithospermum in that all its pollen grains are elongated bodies bearing a row of pores at each end of the grain as opposed to a single row of pores at the equator for Echioides and Lithospermum. However, that need not concern one interested in the cultivated species of these three genera, for they can be separated easily by the following key:

1. Corolla yellow to orange with 5 blackish or purplish evanescent spots at the base of each sinus between the lobes; corolla-throat lacking appendages or hairs, sometimes with scattered glands.
   2. Plant perennial; style forked, the stigmas bilobed and somewhat united. . . . . Echioides
   2. Plant annual; style twice forked, the stigmas 4 and separate. . . . . Arnebia
1. Corolla yellow, orange, or white; corolla-throat always bearing appendages, hairs, or stalked glands. . . . . Lithospermum

Although Arnebia decumbens and Echioides longiflorum are now not at all common in cultivation in the United States, they are attractive plants and deserve a spot in the garden. Admittedly, one draw-back to Arnebia decumbens is that it is an annual and, therefore, seeds must be planted every year; however, both taxa are said to be of easy culture.

# Plantsmen in Profile, VII: George W. Park and Sons

Mary H. Moon

When great-grandmother planned her spring flower garden she studied with interest the list of seeds from that new seedsman, George W. Park - they were so inexpensive! A generation later, grandmother relied on Mr. Park's seeds too, confident they would do well in the family garden. Today, mother orders from the same company, although she deals with the Park sons, George B. and William J.

Great-grandmother would have been surprised had she known the seed list she first received in 1868 was prepared and printed by an enterprising lad of fifteen years. George W. Park saved his pennies, bought seed in bulk from reliable dealers, packeted them, and purchased a small hand printing press for his needs. He set up his small business in his Fannettsburg, Pennsylvania, home, sending the short 4-page list of seeds he had to offer to a slightly longer list of names of persons who might purchase them. With the help of a devoted sister, the business weathered its and Park's youthful years, his studentship at Michigan Agricultural College, and it prospered.

Two decades later, at least by 1890, the growing enterprise was housed in larger quarters at Parkton, Pa. Here were offices, packing and storage rooms, and a publication house with steam-driven printing and bookbinding machinery. Gardens and greenhouses surrounded the buildings, and the enterprise was tended by a good-sized labor force.

At the turn of the century the Parkton location gave way to a more spacious center in La Park (now Paradise), in the same state. To his Floral Guide, issued since the business began, Park had added by the autumn of 1871 the well-known monthly, Park's Floral Magazine. This provided reports on the kinds of plants in gardens and the new ones Park grew successfully in his trial plantings. By 1900 the catalogue had 300,000 readers in the United States; five years later the number was nearly double, and at the time the firm was closed by Mr. Park's retirement in 1919 the circulation was 800,000. By that date the Floral Magazine was received in 600,000 homes.

The inexpensive seed of high quality brought in the orders. The informal observations written in the catalogues by this friendly

man brought pleasure to many a prospective buyer; and if nothing else, a multitude of readers reordered the Magazine. Some found their letters reprinted in its pages as testimonies to the excellence of the plants produced. Others read the poems that gardeners like themselves had submitted. Still others took time to read the serials that occasionally ran in the magazine. Through the pages there were woven a thread of homely philosophy, expressions of a love for people and plants, a sense of devoutness that made the catalogues good reading for the entire family.

On retirement, at the age of sixty-six, Mr. Park married for the second time and settled in Clearwater, Florida. There his son, George Barratt, was born in June 1920. Plants had for so long been Park's joy and work that he had to plant a garden. It tried to grow into a business, but Florida's climate was unsuited to the kinds of plants Park wished to grow. With his determination, something had to give. The family moved to Greenwood, South Carolina, his wife's former home, and there in 1925 the Park Seed Company was reestablished. In that same year a second son, William John, was born.

It was difficult for a man in his seventies to reinterest old customers and to acquire new ones. Abetted by the Great Depression, when more people bought seeds and raised plants instead of buying them, the business grew slowly. Gradually the catalogue circulation climbed to 350,000. George W. Park continued active management of the firm and maintained a personal correspondence with gardener-patrons until a few months before his death in 1935. His wife continued it after him until his sons were able to take it over.

The 1936 memorial catalogue offered the dahlia 'George W. Park', "glowing white, framed in pink petals." Mr. Park had selected it earlier as one to bear his name, provided that it be made available at a price gardeners could afford. Throughout his life, it had been his guiding principle that seeds should be as moderately priced as possible - in 1935 his seeds were still offered at five cents a packet. The tubers of this dahlia, originated by W. L. W. Darnell, were offered for three dollars each, rather than the ten or more dollars at which new dahlias usually were priced.

The sons - George B. and William J. Park - grew up among the firm's gardens and greenhouses, were steeped in the family talk about seed production and merchandizing, and were well indoctrinated from childhood in their father's business philosophy. Their love of plants, enriched by maintenance of their own small gardens, conditioned them for leadership in their father's firm. Mrs. Park supervised their training in the pleasures and problems of growing plants and of managing a seed business. With college training and World War II service behind them, the boys took charge of the firm in 1947, with George carrying the executive load and William the production responsibilities. Except for two

years before the War, when George managed it, Mrs. Park headed the firm from 1935 until 1947.

Figures are not available on the inventory and financial investments of the firm before 1947, but from then onward the firm's growth is a matter of record. The dollar volume has grown from $30,000 to $150,000. The number of kinds of seeds carried each year has been as high as 5,000, but last year was reduced to 3,000.

At the ten acres at Greenwood, South Carolina, are gardens, greenhouses, and test plots, tended by the brothers and fifteen full-time and as many part-time workers. The gardens and greenhouses are primarily for production of perennials and window-garden plants. Seeds put up by the firm in its retail packets are purchased from other commercial firms, the choice being based on test plantings at Greenwood which have proved the quality of the seeds. Seventy-five percent of Park material comes from North American seedsmen and the balance is largely from European sources. A few firms in South America and private collectors in other areas provide some seeds of material native in Asia and Australia. The goal of the firm has always been to make quality plants available cheaply. Thus, while few kinds of plants have been introduced to American horticulture by this firm, many kinds have been made available to gardeners and small home owners who could not have had them except at Park's low prices. George B. Park recently expressed this very well when he said, "Our contribution - if there be any - to the seed world is providing a source for a great number of varieties and species which are not generally available, and perhaps creating some interest in a few of the less usual kinds."

The Parks are now entering a new phase of their business: producing improved strains and cultivars through carefully planned and controlled breeding programs. Now a "spare time" activity, they plan to develop it as an important part of their work. One of their hybrids, first offered in 1946, is a double begonia, 'Christmas Candle', described as an $F_1$ hybrid with fifty percent of the plants produced from each packet bearing fully double ball-shaped crimson flowers and the balance with semi-double flowers. Some of the firm's other recent introductions are: Petunia 'Blue Lace', an $F_1$ purple-flowered, frilled cultivar; Morning Glory 'Tinkerbell's Petticoat', a double-flowered strain in a variety of colors; Impatiens 'Park's Snowflake', a dwarf with pure white flowers; Zinnia 'Peppermint Stick', having "petals" with a golden-yellow or white ground striped and flecked crimson-red.

Their current catalogue, which they write but no longer print, is sent to over 140,000 home gardeners, florists, and bedding plant growers. In addition, their advertisements of a wide range of gesneriads are a regular feature of the journal The Gloxinian, (where an informative account of the firm's growth was published in the November-December, 1954 issue).

# Book Reviews

"Flowers Native to the Deep South," by Caroline Dormon. 176 pp., with 33 color plates, 102 figures. Claitor's Book Store, 241 North St., Baton Rouge 2, Louisiana. 1958. $7.50.

As a successor to Miss Dormon's "Wild Flowers of Louisiana" (1934) this volume not only brings the latter up to date, but considerably increases the area it covers and its utility to persons concerned. Although Miss Dormon does not formally define the "Deep South," it is the broad belt along the Gulf of Mexico from eastern Texas to the Atlantic coast of Georgia and South Carolina. It includes also the states of Mississippi, Louisiana, Alabama, and the northern part of Florida. Peninsular Florida, because of its very different and distinctly subtropical flora, is omitted. Conversely, the rich admixture of northern plants of North Carolina, Tennessee, and Kentucky, was responsible for omitting wildflowers of those states. Wildflowers are conventionally treated by Miss Dormon to include the native herbaceous plants prized for their showy flowers. Unconventionally, there are included the horsetails (Equisetum) and a few plants whose flowers generally are not considered to be showy (e.g., Rumex, Cuscuta).

The illustrations are by the author - once an art major at Judson College, Marion, Alabama - and her color productions have that rare combination too seldom encountered in books of this kind: charm, artistic merit, and meticulous fidelity to the original. It is little wonder that the originals have been much sought after as subjects for home decoration, but it is regretted that few have been preserved as examples of the work of an outstanding botanical artist. All except two of the color plates (nos. XI and XVI) of the earlier work are included in this new book, plus 10 new plates (nos. I, IX, X, XIV, XV, XX-XIV and XXVI) prepared especially for it. A total of 65 genera and 91 species are illustrated in color, and an additional 70 genera and 138 species are illustrated by 102 line drawings (the 38 line drawings in the earlier work are included here).

By comparison, it is noteworthy that descriptions are provided for 231 genera and 425 species, with 115 additional species contrasted or referred to incidentally. Here, however, is the key to what seems to be one deficiency in an otherwise most excellent book: while less than one-third of the species accounted for are illustrated, it is only by means of the illustrations that the non-botanist can reach Miss Dormon's objective for the book - a work written for those "who cannot be content until they learn [a wild flower's]

name." Approximately 100 of the genera described are not illustrated. The uninformed person using this book as a guide by which to learn the names of wild flowers not previously known to him will miss some of the devices usually provided in books on the local flora and designed to facilitate one's learning the identity of wildflowers. These could be in the nature of formal keys, or of nontechnical groupings by flower color, habitat type, period of bloom, and identifying characters of flowers or foliage. The addition of some identification aids, perhaps in an appendix, would have done much to increase the usefulness of the book to persons seeking to learn the names of unknown wild flowers of the region.

The charm and value of the book are to be found in Miss Dormon's descriptions of the plants. These are excellent, technically accurate, and could have been drawn only from observation and intimate knowledge of the plants as living subjects. Intermixed, like subtle flavoring in a gourmet's dish, are keen observations on environmental requirements, plant associations, and habitats - and there are droll but effective witticisms that strike at the occasional ineptness of botanists, stoutly champion her own accurate taxonomic opinions drawn from field knowledge of the plants, and plead for less lumping of species and of genera by herbarium botanists who may never have known the plants in native environments. Scattered freely through the text are notes on flower fragrance, conservation and preservation, local uses, and vernacular names.

This book has been "in the making" for several years. Its private publication reflects the author's determination to make it available at the lowest price possible without loss of quality in production. The latter has been assured by one of the country's leading manufacturers of fine books - The Mount Pleasant Press of Harrisburg, Pennsylvania - whose layout, typography, and excellent color work contribute materially to the readability and utility of this volume. The combined talents of the author and of the Press's editor, Miss Catherine Meikle, are reflected in the apparent absence of typographic errors - a rare accomplishment in any book.

"Flowers Native to the Deep South" is clearly the product of long and studied attention, of consultation with specialists on particular plant groups, and of an enduring affection for the hundreds of plants that are treated. For Miss Dorman its production is indeed a triumph, the culmination of an unswerving devotion to a public that has rightfully learned to respect her profound and intimate knowledge of the plants of the Deep South. By her skill with brush and pen she has provided this and future generations with as fine an account of the wild flowers of a too-little-known region as exists for any part of this country.

G.H.M.L.

"Guide List to Plants in the Strybing Arboretum" by Eric Walther and Elizabeth McClintock. 76 pp. with 2 maps. Strybing Arboretum Society, Golden Gate Park, San Francisco, Calif., 1958. Paperback, $1.00; buckram $3.50; plus postage.

The Strybing Arboretum and Botanical Garden was founded in 1937 following a generous bequest for this purpose by Mrs. Helene Strybing to the City of San Francisco. It occupies about 40 acres on the south-central side of Golden Gate Park and for twenty years was developed and supervised by Mr. Eric Walther. His retirement last year was capped by the production of this Guide List.

Published lists of inventories of botanic gardens and arboreta become an important part of horticultural literature because they document the names of plants reported to be growing at a particular time. Collectively they are a record of man's use of the world's flora. The list here reviewed is especially significant because the Bay Area of California is one whose cultivated flora is rich in exotics but it is an area whose literature has not kept pace with the introduction of new kinds of plant materials. This list is of further significance because the Strybing Arboretum steadily introduces new sorts into the commercial trade and private collections of the area.

This Guide List is an alphabetic enumeration of the 961 genera represented and the approximately 2,200 species reported to be in the garden. For each species there is given the family affiliation, country where native, and its location in the garden. In addition there is a compilation of the common names used in California for these species, a compilation which is one of the most complete this reviewer has seen.

The nomenclature is up-to-date and exceedingly accurate. Cultivars are so designated and their names are enclosed within single quotation marks. In general, the taxonomic concepts are conservative: Allium, Agapanthus, and Ipheon are retained in the lily family (not accepted as members of the amaryllis family), and Mesembryanthemum is treated as a broad all-inclusive genus (not divided into segregate genera as in Hortus Second or Bailey's Manual). Here there is not consistency, however, since Hebe is accepted as a genus distinct from Veronica, Malus and Sorbus are kept separate from Pyrus, and Sequoiadendron is treated as distinct from Sequoia - all in keeping with the more liberal interpretations of relationships. The treatment of genera of the Crassulaceae is especially noteworthy, reflecting the scholarship of Eric Walther who has long given special study to members of the family.

The list should be of interest to many persons outside coastal central California. For writers of horticultural literature, the

up-to-dateness of its nomenclature will make it a valued source of reference. Persons in the Gulf states, Puget Sound area, and central Coastal Plain area will find its listings suggestive of material to be tested in their respective areas. The publication of such competently prepared lists is encouraged and reviewing one such as this becomes a pleasure.

G.H.M.L.

"The Azalea Book," by Frederic P. Lee. 324 pp., with 6 color plates, 56 black-and-white plates. D. Van Nostrand Co., Inc., Princeton, New Jersey. 1958. $8.95

This work is addressed to the serious amateur gardener, and is actually an encyclopedia of all the information on azaleas and azalea culture in America that any non-commercial horticulturist is likely to need or be interested in. It is comprehensive, the information is sound, and it is written throughout in a straightforward and unpretentious style that makes very pleasant as well as profitable reading. As the author states in his foreword, much of the information included has never been published previously, though some of it was included in the American Horticultural Society's earlier Azalea Handbook. Mr. Lee has had the cooperation and assistance of many noted specialists in the preparation of this book. No serious gardener with an interest in azaleas will be without it.

To enumerate all the topics herein discussed would be impractical in a mere review. The twenty-two chapters are grouped into four major parts: Azalea Culture - A Garden Guide; Basic Azalea Horticulture - An Analysis; Historical Background; Descriptive Lists of Azaleas; and there are three appendices as well.

Azalea Culture includes, in addition to practical advice on the expected aspects of this composite subject, information on the hardiness of various azaleas, in a form especially useful but not available elsewhere. A numbered series of low-temperature zones is given for the United States, then major cities representing the various geographical areas in all the states are rated according to these zones, and, finally, most of the available species and the major hybrid groups of azaleas are rated also according to the low-temperature zones they may be expected to endure. Even more unusual is similar information on high-temperature limits for certain species and groups in which this factor is important. Such precise data as these go a long way toward solving the problem of what kinds can be expected to be hardy in any particular region, a problem which so often has to be worked out by experimen-

tation and trial that can prove wasteful of money, time, labor, plant material, and even enthusiasm on the part of the tyro. The instructions for propagation of azaleas, especially by seed and by cuttings, are so lucid and clear-cut that one wishes, while reading them, for acres of land on which to plant out the wealth of azaleas one could so easily thus acquire through one's own efforts.

Part II, Basic Azalea Horticulture, is concerned with plain and easily intelligible discussion of the more technical aspects of such topics as the range of variation to be found in the habit, flowers, and leaves of azaleas as a group; soils, mulches, and mycorrhiza (minute fungal organisms living in association with plant roots); nutrition, light, water, and air; and hybridizing that may be carried on by amateurs.

Part III, Historical Background, includes, in part, botanical relationships of azaleas and "true" rhododendrons, their geographical distribution and evolutionary history, and the rules for naming and registering azalea cultivars, as well as histories of the important hybrid groups.

The Descriptive Lists of Azaleas which compose Part IV comprise descriptions of species and hybrid groups and of most clones of both of these presently available in the United States, and also lists of especially recommended clones, a great help to those who do not have experience and familiarity with sufficiently many kinds to be able to choose among them wisely for a small or initial selection.

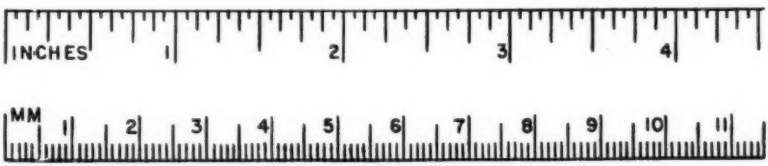
The three appendices consist of concise notes on the work of individual contemporary azalea breeders in America, a list of azalea nurserymen (specialists), and a briefly annotated list of the azalea introductions of the Plant Introduction Section of the U.S.D.A. The Azalea Book is really exemplary as a specialized horticultural handbook. W.J.D.

## ABBREVIATIONS USED IN BAILEYA

| | | | | | |
|---|---|---|---|---|---|
| ann. | annual | dm. | decimeter | lf. | leaf |
| bien. | biennial | fl. | flower | lft. | leaflet |
| br. | branch | fls. | flowers | lvs. | leaves |
| brt. | branchlet | flt. | floret | mm. | millimeter |
| caps. | capsule | fr. | fruit | per. | perennial |
| cl. | clone | ft. | foot | segm. | segment |
| cm. | centimeter | hort. | horticultural | st. | stem |
| cv. | cultivar | in. | inch | sts. | stems |
| diam. | diameter | infl. | inflorescence | var. | variety |

## METRIC - ENGLISH EQUIVALENTS (approximate)

| | | |
|---|---|---|
| 6 mm. - 1/4 in. | 10 cm. - 4 in. | 10 mm. - 1 cm. |
| 12 mm. - 1/2 in. | 1 dm. - 4 in. | 10 cm. - 1 dm. |
| 25 mm. - 1 in. | 3 dm. - 1 ft. | 10 dm. - 1 meter |
| 2.5 cm. - 1 in. | 10 dm. - 1 yd. | |
| 5 cm. - 2 in. | 1 m. - 39 in. | |




Published at the Bailey Hortorium
of the New York State College of Agriculture
a Unit of the State University of New York
at Cornell University, Ithaca, New York